Chronic knee pain while awaiting arthroplasty is associated with worsening joint-specific function, health-related quality of life and personal wellbeing, and increased use of opioid analgesia

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Aims

To assess whether chronic knee pain (CKP) influenced health-related quality of life (HRQoL), knee-specific health, wellbeing, and use of opioid analgesia, and identify variables associated with CKP in patients awaiting knee arthroplasty.

Methods

This study included 217 patients (mean age 69.7 years (SD 8.7), 116 female (53%)) who completed questionnaires that included the EuroQol five-dimension questionnaire (EQ-5D) and EuroQol-visual analogue scale (EQ-VAS), Oxford Knee Score (OKS), and wellbeing assessments at six and 12 months after being listed for surgery. Analgesia use at 12 months was also recorded. CKP was defined using the OKS pain score (PS) of ≤ 14 points at 12 months.

Results

At 12 months, 169 patients (77.9%) had CKP. Compared with those without CKP, those with CKP had clinically meaningfully worse HRQoL and knee-specific health at 12 months and were more likely to have a health state worse than death (odds ratio (OR) 29.7, 95% CI 4.0 to 220.2; $p < 0.001$). The CKP group were more likely to use weak (OR 3.03, 95% CI 1.65 to 7.96; $p = 0.001$) and strong (OR 11.8, 95% CI 1.58 to 88.88; $p = 0.001$) opioids for analgesia. The CKP group had worse overall wellbeing with significantly ($p < 0.001$) lower satisfaction with life, life being worthwhile and happiness, and increased anxiety. The CKP group had a significant ($p < 0.001$) deterioration in their OKS, OKS-PS, EQ-5D, and EQ-VAS from six to 12 months, which was not observed in the group without CKP. A worse OKS-PS at six months was independently associated with an increased risk of CKP, and a threshold value of < 13 (sensitivity 91.7%, specificity 94.7%) was an excellent discriminator (area under the curve 96.9, 95% CI 94.2 to 99.6; $p < 0.001$).

Conclusion

Four in five patients had CKP after waiting 12 months, which was associated with deteriorations in HRQoL and knee health, worse wellbeing, and increased opioid analgesia use. The OKS-PS at six months could be used to identify patients at risk of CKP after 12 months of waiting.

Take home message

- The majority of patients who have waited 12 months for a knee arthroplasty are in chronic pain, which was associated with deteriorations in health-related quality of life and knee health, worse wellbeing, and increased opioid analgesia use.

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Introduction

Knee osteoarthritis (OA) affects an estimated 654 million people worldwide, and is the most likely diagnosis of knee pain in patients aged 45 years or older who present with activity-related knee joint pain.[1] Surgical referral for knee arthroplasty (KA) can be considered for patients with end-stage OA and inability to cope with pain after using all appropriate conservative options. Following KA, the intensity of pain stabilizes between three and six months following surgery.[2] However, in view of the increasing surgical waiting lists, patients are having to wait longer for KA and endure their pain with negative effects on their health-related quality of life (HRQoL).[3] Although those patients waiting for KA surgery by definition have failed nonoperative management of their pain, the severity of knee pain will likely vary from patient to patient. For those with more severe pain, opioid analgesia may be prescribed but this has the potential for abuse, addiction, and adverse health effects.[4-7] Prolonged use can result in physical and psychological dependence, and abrupt discontinuation may cause severe withdrawal symptoms. Furthermore, opioid use preoperatively is associated with worse outcomes following KA.[8]

Chronic knee pain (CKP) in those awaiting KA is difficult to define as most patients will have had knee pain for a prolonged period, likely longer than six months, before being referred for consideration for surgery. Pain to the extent that it negatively influences a patient's HRQoL is used to define chronic pain following a KA.[9] The Oxford Knee Score (OKS)[10] has a pain component that can be used to define CKP postoperatively. To the authors' knowledge, there is no literature that has assessed the prevalence of CKP in patients awaiting KA or whether this is associated with deterioration in their knee-specific function, HRQoL, or general wellbeing while waiting for surgery.

The primary aim of this study was to assess whether CKP influenced HRQoL while waiting for a KA. Secondary aims were to assess whether CKP: 1) influenced knee-specific function and personal wellbeing; 2) was associated with increase opioid analgesia use; and 3) to identify independent variables at six months associated with chronic pain at 12 months.

Methods

A prospective single-centre study was conducted. Ethical approval was obtained for data collection (Scotland B REC and the number 20/SS/0125 A), and the study was registered and approved at the study centre. Patients on the waiting list for KA (total (TKA) or partial (PKA)) from March 2021 to September 2021, and were still awaiting surgery at six months, were identified from an electronic database held at the study centre.

Patients meeting the inclusion and exclusion criteria were selected from the waiting list. Patient demographics (age and sex), proposed procedure (TKA or PKA), and date when listed were recorded. Patients were contacted using a postal questionnaire that included the patient-reported outcome measures (PROMs). The inclusion criteria were patients placed on the elective orthopaedic waiting list for a primary KA and had been waiting for six months for surgery with no surgery date. Patients listed for revision surgery or urgent arthroplasty were excluded as they were likely to have surgery before waiting 12 months. Patients were sent a questionnaire to complete at six months and for those patients who responded, a second questionnaire was sent out at 12 months.

The EuroQol five-dimension questionnaire (EQ-5D) evaluates five domains: mobility, self-care, usual activities, pain/discomfort, and anxiety/depression.[11] The three-level (3L) version of the EQ-5D questionnaire (EQ-5D-3L) was used, with responses to the five domains recorded at three levels of severity (no/slight problems, moderate/severe, or unable/extreme problems).[12] Permission was obtained from the EuroQol Research Foundation (Rotterdam, the Netherlands) to use the UK version of the EQ-5D-3L version. This index is on a scale of -0.594 to 1, where 1 represents perfect health and 0 represents death. Patients scoring less than zero for the EQ-5D score were defined to be in a state worse than death (WTD).[13]

The OKS is a joint-specific assessment that consists of 12 questions assessed on a Likert scale from 0 to 4 to give a total score ranging from 0 (worst) to 48 (best).[14] The minimal clinically important difference (MCID) in the OKS is five points after KA.[15] HRQoL was assessed using the EQ-5D with the responses recorded at 3L.[11] This ranges from -0.594 (worst health) to 1 (best health). The EuroQol-visual analogue scale (EQ-VAS) for general health was also used, where 0 is worst health and 100 is best HRQoL.[11] The MCID after KA for the EQ-5D is 0.085 and 6.4 for the EQ-VAS.[16]

Chronic pain was defined using the pain component score of the OKS.[10,17] The OKS can be separated into pain score (OKS-PS) and functional score.[17] Pinedo-Villanueva et al[10] previously identified that patients with a score of 14 or lower on the seven-item OKS-PS component (on a scale of 0 being the worst to 28 being the best) after surgery had pain that negatively affects their HRQoL. Patients with an OKS-PS of 14 or less at 12 months were defined to have CKP with the assumption that they had endured this pain during the intervening six months (chronic).

Patient wellbeing was assessed using a survey from the Office for National Statistics known as the ONS4.[18] The questions are: "Overall, how satisfied are you with your life nowadays?", "Overall, to what extent do you feel the things you do in your life are worthwhile?", "Overall, how happy did you feel yesterday?", and "Overall, how anxious did you feel yesterday?" The responses to these questions were measured on a scale from 0 ("not at all") to 10 ("completely").

Statistical analysis and matching

Statistical analysis was performed using the Statistical Package for Social Sciences v. 17.0 (SPSS, USA). Simple descriptive analysis was undertaken according to mean/median and SD/IQRs. Paired and independent-samples *t*-tests were used to compare parametric continuous variables within and between groups, respectively. A Mann-Whitney U test was used to compare non-parametric continuous variables between groups. A chi-squared test was used to compare categorical variables between groups. Receiver operating characteristic curve (ROCC) analysis was used to assess the predictive value of continuous variables as predictors of chronic pain. This is reported as an area under the curve (AUC), where 0.5 equates to no discrimination, 0.5 to 0.7 has poor discrimination, 0.7 to 0.8 has acceptable discrimination, 0.8 to 0.9 has excellent discrimination, and more than 0.9 has outstanding discrimination. A threshold value that offered the highest specificity and

Table I. Patient demographics and patient-reported outcome measures of patients who have been waiting for a knee arthroplasty for 12 months according to whether they have chronic pain or not (control).

Variable	Control group (n = 48)	Chronic pain group (n = 169)	Difference (95% CI)	p-value
Sex, n (%)				
Male	19 (39.6)	82 (48.5)	OR 0.70 (0.36 to 1.34)	0.273*
Female	29 (60.4)	87 (51.5)		
Mean age, yrs (SD)	72.1 (8.6)	69.0 (8.6)	MD 3.1 (0.3 to 5.9)	0.028†
Mean OKS (SD)	28.0 (7.0)	13.0 (5.7)	MD 15.0 (13.1 to 16.9)	< 0.001†
Mean OK-PS (SD)	15.9 (4.4)	6.3 (3.5)	MD 9.6 (13.1 to 16.9)	< 0.001†
Mean EQ-5D (SD)	0.630 (0.206)	0.160 (0.302)	MD 0.471 (0.379 to 0.563)	< 0.001†
Mean EQ-VAS (SD)	72.8 (15.5)	48.1 (22.3)	MD 24.7 (17.9 to 31.6)	< 0.001†
Mean pain-VAS (SD)	62.2 (20.1)	38.9 (23.0)	MD 23.3 (16.0 to 30.5)	< 0.001†
WTD, n (%)				
No	47 (97.9)	103 (60.9)	OR 29.7 (4.0 to 220.2)	< 0.001‡
Yes	1 (2.1)	65 (38.5)		
Missing	0 (0.0)	1 (0.6)		

*Chi-squared test.
†Independent-samples *t*-test.
‡Fisher's exact test.
EQ-5D, EuroQol five-dimension questionnaire; EQ-VAS, EuroQol-visual analogue scale; MD, mean difference; OKS, Oxford Knee Score; OKS-PS, Oxford Knee Score pain score; OR, odds ratio; WTD, worse than death.

Table II. Analgesia use for patients who have been waiting for a knee arthroplasty for 12 months according to whether they have chronic pain or not.

Variable	**Chronic pain group** (n = 169)	**Control group** (n = 48)	**Odds ratio** (95% CI)	p-value
Paracetamol, n (%)				
Yes	90 (53.3)	32 (66.7)	0.57 (0.29 to 1.12)	0.098*
> 3 months	88 (52.1)	27 (56.3)	0.85 (0.44 to 1.61)	0.609*
NSAIDs, n (%)				
Yes	51 (30.2)	17 (35.4)	0.79 (0.40 to 1.55)	0.490*
> 3 months	57 (33.7)	18 (37.5)	0.85 (0.44 to 1.65)	0.628*
Weak opioids, n (%)				
Yes	80 (47.3)	11 (22.9)	3.02 (1.45 to 6.32)	0.002*
> 3 months	77 (45.6)	9 (18.8)	3.63 (1.65 to 7.96)	0.001*
Strong opioids, n (%)				
Yes	34 (20.1)	1 (2.1)	11.8 (1.58 to 88.88)	0.001†
> 3 months	27 (16.0)	2 (4.2)	4.37 (1.00 to 19.10)	0.032†

*Chi-squared test.
†Fisher's exact test.
NSAIDs, nonsteroidal anti-inflammatory drugs.

sensitivity was identified for predicting chronic pain. Logistic regression analysis was used to identify independent variables associated with chronic pain at 12 months. A p-value < 0.05 was defined as statistically significant.

A power calculation was performed for a medium effect size of 0.5 in the EQ-5D (primary outcome measure) with an α 0.05 with a power of 80% to demonstrate a worse HRQoL in the chronic pain group (two-tailed analysis) with an estimated 1:4 ratio (80% chronic pain).[3] It was determined that a minimum of 156 in the chronic pain group and 39 in the non-chronic pain group would be required.

Results

During the study period, questionnaires were sent to 250 patients who had been waiting six months for a KA by post, and 243 patients (97%) returned them. By 12 months, 22

Table III. Wellbeing (Wellby) scores according to the four components assessed at 12 months according to group.

Wellby component	**Control group** (n = 48), median (IQR)	**Chronic pain group** (n = 169), median (IQR)	p-value*
Satisfaction with life			
Six months	8.0 (6.0 to 8.0)	5.0 (3.0 to 7.0)	< 0.001
12 months	8.0 (7.0 to 8.0)	4.5 (2.0 to 6.0)	< 0.001
p-value†	0.521	< 0.001	
Life worthwhile			
Six months	8.5 (7.0 to 9.8)	7.0 (4.0 to 9.0)	< 0.001
12 months	8.0 (7.0 to 9.0)	5.0 (3.0 to 8.0)	< 0.001
p-value†	0.334	< 0.001	
Happiness			
Six months	8.0 (7.0 to 9.0)	6.0 (4.0 to 8.0)	< 0.001
12 months	8.0 (7.0 to 9.0)	5.0 (3.0 to 7.0)	< 0.001
p-value†	0.561	< 0.001	
Anxiety			
Six months	1.0 (0.0 to 5.0)	4.0 (1.0 to 6.8)	0.004
12 months	2.0 (0.0 to 6.0)	5.0 (2.0 to 7.0)	0.020
p-value†	0.110	< 0.001	

*Mann-Whitney U test.
†Wilcoxon signed-rank test.

had undergone surgery in the NHS, four were removed from the waiting list for health reasons, and 217 patients continued to wait. This cohort consisted of 116 females (53.5%) and 101 males (46.5%), with a mean age of 69.7 years (SD 8.7). There were 169 patients with CKP. There was no difference in sex (p = 0.273, chi-squared test), but those with CKP were younger (p = 0.028, independent-samples *t*-test) compared to those without CKP (Table I). Those with CKP had clinically meaningfully worse knee-specific pain and function and HRQoL at 12 months compared to those without CKP (Table I), and were more likely to have a WTD health state (odds ratio (OR) 29.7, 95% CI 4.0 to 220.2; p < 0.001, Fisher's exact test). The CKP group were also more likely to use weak (OR 3.63, 95% CI 1.65 to 7.96; p = 0.001, chi-squared test) and strong (OR 11.8, 95% CI 1.58 to 88.88; p = 0.001, Fisher's exact test) opioids, and were more likely to have taken them for more than three months by the time they had waited 12 months (Table II). The CKP group had worse overall wellbeing with significantly (p < 0.001, Mann-Whitney U test) lower satisfaction with life and with life being worthwhile and happy, as well as increased anxiety (Table III).

The CKP group had significant (p < 0.001, paired *t*-test) deteriorations in their OKS, OKS-PS, EQ-5D, and EQ-VAS from six to 12 months, which were not observed in those without chronic pain (Table IV).

Younger age and worse PROMs at six months were all associated with CKP at 12 months (Table V). Logistic regression analysis was undertaken to assess the impact of six-month variables on the likelihood that patients experienced CKP at 12 months. To reduce the number of variables in the model, forward stepwise (likelihood ratio) logistic regression was employed to identify common significant variables associated with risk of CKP at 12 months. All six-month variables (Table V) were introduced into the model. The final model contained only one variable (OKS-PS), which was statistically significant (148.8; p < 0.001, chi-squared test), indicating the ability to distinguish between patients with and without CKP at 12 months. The model, as a whole, explained between 50.9% (Cox and Snell R squared) and 78.2% (Nagelkerke R squared) of the variance in the pain status and correctly classified 96.2% of the cases. A worse OKS-PS (OR 0.42 (for each point change in the score), 95% CI 0.31 to 0.56; p < 0.001, logistic regression) at six months was associated with an increased risk of chronic pain at 12 months. Using a threshold value of < 13 (sensitivity 91.7% and specificity 94.7%) in the six-month OKS-PS was an excellent discriminator (AUC 96.9, 95% CI 94.2 to 99.6; p < 0.001, ROCC) of CKP at 12 months (Figure 1).

Discussion

This study has shown that by the time patients had waited 12 months for their KA, 77.9% were suffering from CKP. Those with chronic pain had clinically meaningfully worse knee-specific health and HRQoL, and were more likely to have a health state that was WTD, a worse overall wellbeing with significantly lower satisfaction with life and life being worthwhile and happiness, and increased anxiety. The CKP group was also more likely to use weak and strong opioids, and was more likely to have taken them for more than three months when they had waited 12 months for their KA. Those with CKP also had a significant deterioration in their OKS, OKS-PS, EQ-5D, and EQ-VAS from six to 12 months while awaiting KA, which was not observed in those without chronic pain. The OKS-PS

Table IV. Changes in patient-reported outcome measures at 12 months relative to six months according to group.

PROM	Chronic pain group, mean (SD)	Control group, mean (SD)	Difference (95% CI)	p-value*
OKS change	2.3 (4.5)	0.8 (7.0)	1.5	0.081
95% CI	1.6 to 3.0	-1.2 to 2.8	-0.2 to 3.2	
p-value†	< 0.001	0.436		
OKS-PS change	1.3 (3.0)	0.6 (4.7)	0.7	0.221
95% CI	0.8 to 1.7	-0.8 to 1.9	-0.4 to 1.8	
p-value†	< 0.001	0.394		
EQ-5D change	0.073 (0.257)	0.022 (0.227)	0.050	0.226
95% CI	0.033 to 0.112	-0.044 to 0.89	-0.031 to 0.132	
p-value†	< 0.001	0.503		
EQ-VAS change	6.1 (21.0)	2.0 (12.0)	4.2	0.206
95% CI	2.9 to 9.3	-1.6 to 5.6	-2.2 to 10.6	
p-value†	< 0.001	0.276		
Pain-VAS change	2.9 (26.4)	-3.6 (22.8)	6.6	0.125
95% CI	-1.1 to 7.0	-10.4 to 3.1	-1.8 to 15.0	
p-value†	0.151	0.283		

The rows demonstrate the comparison between those with chronic pain and the control group, while the columns demonstrate the comparison of the change outcomes within each of the groups.
*Independent-samples *t*-test.
†Paired *t*-test.
EQ-5D, EuroQol five-dimension questionnaire; EQ-VAS, EuroQol-visual analogue scale; OKS, Oxford Knee Score; OKS-PS, Oxford Knee Score pain score; PROM, patient-reported outcome measure.

at six months was shown to be a reliable predictor of CKP at 12 months.

The findings of the current study should be interpreted in the knowledge of the limitations. The major limitation is the use of the OKS to define the CKP,[10] which was only defined in a postoperative KA population, but the current study applied this in a preoperative population, which may not be valid to define CKP. Pinedo-Villanueva et al[10] used the EQ-5D to define CKP in using the postoperative OKS-PS. The EQ-5D correlates with both the pre- and postoperative OKS, and should therefore represent similar impact on individuals awaiting KA as those with CKP postoperatively.[19] This study only captures a patient's quantitative assessment of their health state, and their opinion and reasons for deterioration while waiting are not clear. It may be assumed that the observed decline in HRQoL and wellbeing are related to progression of their knee arthritis and increased symptoms. This was also not further quantified with progression of the radiological severity of their arthritis. It would, however, seem reasonable to assume that their general decline is related to their CKP. The cohort assessed was also placed on the waiting list for KA as routine procedures, and those listed for urgent surgery were not included as it was felt that they would have had their surgery prior to the planned 12-month follow-up endpoint. Potentially, this urgent group represents a different cohort of patients that should be explored in future work on this topic. Although the current study was powered, it represents a select cohort from a single centre, and data on a national scale would be needed to affirm the findings. However, multicentre national studies, despite employing a slightly different methodology, do support a significant decline in patients' HRQoL while waiting from six to 12 months for KA.[3,20]

CKP has significant effects on everyday tasks such as rising from a seated position, walking, and getting up and down stairs, all of which profoundly affect an individual's HRQoL.[21] Individuals affected with CKP on average have worse knee-specific outcomes compared to those without chronic pain.[22] More generally, chronic pain, particularly in the lower limbs, has a detrimental impact on life satisfaction due to disability, loneliness, and social isolation.[23] It would therefore seem that delaying KA exacerbates this decline, which is supported by the results of the current study. In addition to secondary impaired physical function, CKP is associated with increased stress levels, which in turn can have detrimental effects on things such as increased alcohol consumption, obesity, and diabetes mellitus.[24] Along with difficulties in movement, CKP has detrimental effects on an individual's ability to self-care,[25] and has significant effects on their mental health, particularly causing increased deterioration in males.[26] Moreover, patients with CKP face a greater risk of psychosocial disability, affecting their interpersonal skills such as the ability to interact and communicate with others.[27] Leite et al[28] investigated the impact of pain on individuals awaiting a KA and demonstrated that nearly 60% experience symptoms of depression, which in part may be related to their physical decline.

Table V. Patient demographics and patient-reported outcome measures of patients who have been waiting for a knee arthroplasty for six months according to whether they had chronic pain or not (control) at 12 months.

Variable	Control group (n = 48)	Chronic pain group (n = 169)	Difference (95% CI)	p-value
Sex, n (%)				
Male	19 (39.6)	82 (48.5)	OR 0.70 (0.36 to 1.34)	0.273*
Female	29 (60.4)	87 (51.5)		
Mean age, yrs (SD)	72.1 (8.6)	69.0 (8.6)	MD 3.1 (0.3 to 5.9)	0.028†
Mean OKS (SD)	28.8 (6.1)	15.3 (5.7)	MD 13.5 (11.6 to 15.4)	< 0.001†
Mean OKS-PS (SD)	16.5 (3.4)	7.6 (3.5)	MD 8.9 (7.8 to 10.1)	< 0.001†
Mean EQ-5D (SD)	0.652 (0.186)	0.235 (0.310)	MD 0.417 (0.323 to 0.510)	< 0.001†
Mean EQ-VAS (SD)	74.4 (13.1)	54.1 (22.4)	MD 20.3 (13.5 to 27.1)	< 0.001†
Mean pain-VAS (SD)	59.3 (18.7)	41.6 (22.3)	MD 17.7 (10.6 to 24.7)	< 0.001†
WTD, n (%)				
No	46 (95.8)	119 (70.4)	OR 13.1 (1.9 to 92.5)	< 0.001‡
Yes	1 (2.1)	46 (27.2)		
Missing	1 (2.1)	4 (2.4)		

*Chi-squared test.
†Independent-samples *t*-test.
‡Fisher's exact test.
EQ-5D, EuroQol five-dimension questionnaire; EQ-VAS, EuroQol visual analogue scale; MD, mean difference; OKS, Oxford Knee Score; OKS-PS, Oxford Knee Score pain score; OR, odds ratio; WTD, worse than death.

Postoperative CKP is prevalent, affecting 15% to 30% of patients undergoing KA.[9] Not only does CKP after KA result in significant morbidity for the individual, it also creates a financial burden on the healthcare system for ongoing care.[29] There is a substantial amount of literature exploring the relationship between preoperative CKP and an elevated risk of postoperative CKP.[9] Hernández et al[30] stated that there was a direct and linear correlation between preoperative pain levels and postoperative outcomes.[30] A systematic review including more than 30,000 patients identified that increased severity of preoperative knee pain was one of the strongest predictors of CKP following KA.[31] Prolonged waiting times to surgery may exacerbate preoperative knee dysfunction, a factor that is intricately linked with compromised postoperative knee function.[32] Preoperative muscle wasting due to CKP has been linked with poorer functionality postoperatively and a higher proportion of patients requiring assistance undertaking activities of daily living up to two years following surgery.[33] Likewise, Brander et al[34] found that patients with greater preoperative pain exhibited an increased likelihood of experiencing poorer knee function after one year compared with their counterparts with lesser pain. Moreover, these individuals with CKP required more frequent home physical therapy sessions and prolonged rehabilitation periods.[34] This is important to consider, as CKP following TKA is associated with reduced function, insomnia, and poorer mental health, such as depression and anxiety.[9] Increased preoperative pain and poorer postoperative outcomes have a significant correlation with an individual's likelihood to return to work.[35]

Patients with unremitting pain have been found to be increasingly susceptible to substance abuse disorders, including opioids, alcohol, and prescription or illegal drugs.[33] Despite opioids not being recommended for treatment of CKP, primarily due to their ineffectiveness in alleviating movement-related pain commonly associated with CKP,[36] a substantial proportion (approximately 40% of those waiting for KA) do, however, resort to opioid use.[37,38] This is supported by the current study. Hellberg et al[39] suggested that KA should be recommended early when indicated; however, delays due to prolonged waiting times compel patients to rely on other methods to manage their symptoms, which include opioids. Furthermore, the use of opioids for analgesia has a strong correlation with opioid abuse, with over 80% of individuals addicted to opioids attributing chronic pain as their reason for initial use.[40] This escalated preoperative opioid dependency has many detrimental effects, including increased postoperative acute pain, increased postoperative opioid consumption, longer recovery periods, and increased risk of early revision or readmission.[4-7] Politzer et al[41] found that more than one-third of chronic opioid users preoperatively continue to rely on opioids following KA. Furthermore, patients taking opioids preoperatively are more at risk of being dissatisfied with their KA outcome postoperatively.[7]

The burden of CKP places a substantial strain on the NHS, with nearly four million annual primary care visits a year for knee pain.[42] Peat et al[43] found that around 4% of the elderly population attended the GP at least once a year due to knee pain. This is a growing problem due to an ageing population and increased incidences of osteoarthritis necessitating KAs. A study from the USA found that KAs completed after a two-year wait incur significantly greater financial costs than those surgeries completed straight away.[44] In the UK, on average, individuals living with CKP have an increased economic burden on the healthcare system of around £1,709 per year.[29]

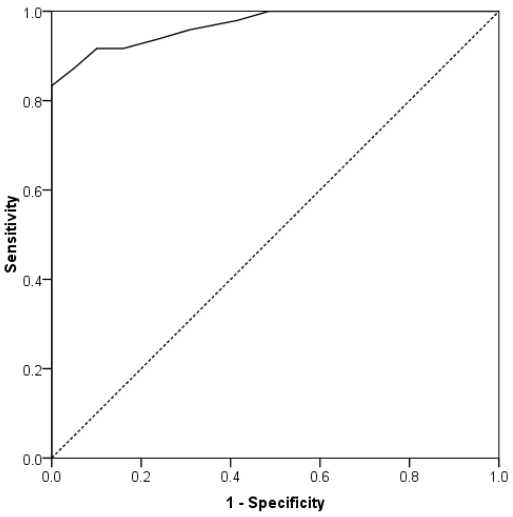

Fig. 1
Receiver operating characteristic curve for predicting chronic pain at 12 months while waiting for a knee arthroplasty using the six-month Oxford Knee Score pain score.

The findings advocated for reducing wait times as this is both beneficial for the patient and cost-effective.[44] Falls represent a high proportion of elderly healthcare burdens, with an estimated 28% to 35% of individuals aged 65 years and over experiencing at least one fall annually.[45] These statistics are highly significant due to their implications on reduced mobility, diminished HRQoL, and the emergence of psychological problems such as fear of falling.[45] CKP exacerbates the risk of falls in the elderly,[46] primarily due to the association of CKP with reduced balance and strength, thus predisposing them to fall-related incidents.[47] Indeed, increased severity of joint pain is positively associated with increased propensity for falls.[46] This highlights the profound health consequences, both physical and psychological, associated with falls among the elderly demographic.

In conclusion, nearly four in five patients had CKP after waiting 12 months for their KA, which was associated with a significantly worse HRQoL, knee health and wellbeing, and use of opioid analgesia. CKP was associated with a significant deterioration in HRQoL and knee health over the prior six-month period, which was not observed in those without CKP. The OKS-PS at six months could be used to identify patients at risk of CKP at 12 months.

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Data sharing

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Ethical review statement

Ethical approval was obtained for data collection (Scotland B REC and the number 20/SS/0125 A) and the study was registered and approved at the study centre.